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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: GELATINIZED STARCH MATRIX INSECT BAIT (57) Abstract An insect bait containing an insect-controlling material in a gelatinized starch matrix. The bait is made by co-extruding starch with the insect-controlling material at temperature and pressure conditions sufficient to cook and gelatinize the starch, or alternatively by mixing pregelatinized starch with the insect-controlling material and water to form a gel. The bait is effective in controlling insects.		

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GELATINIZED STARCH MATRIX INSECT BAITFIELD OF INVENTION

This invention is directed to insect bait. More particularly, the invention is directed to an insect bait
5 useful in controlling various insects such as ants and roaches having gelatinized starch as the bait matrix.

BACKGROUND AND PRIOR ART

Efforts to safely and effectively control insects such as ants and roaches commonly found in household,
10 restaurant, and hotel environments have been going forward continuously almost since the beginning of mankind with varying degrees of success. These prior art efforts have included the use of direct and residual sprays as well as solid baits which may contain chemical additives which are
15 designed to have varying effects on the insect, including on its ability to reproduce or outright death.

With solid baits, substantial effort has been directed to baits which attract the insect, leading the insect to devour the bait and an insecticide contained in

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the bait, with the desired result. Other efforts have been directed to baits which repel the insect and, thus, cause the insect to seek a new environment. These efforts have provided baits containing various attractants, including starches. For example, U.S. Patent No. 960,287 discloses an insecticide composition which can contain from 15% to 20% cornstarch. The cornstarch is present in an insecticidal mixture of two metallic salts to separate the respective salt particles and prevent chemical reaction between the salts. U.S. Patent No. 4,321,258, on the other hand, discloses a non-toxic insecticide which can include, inter alia, cornstarch as an attractant for an insect. Various other United States patents such as U.S. Patent Nos. 2,687,365 and 4,332,792 disclose the use of corn syrup and similar materials as insect attractants in insect traps and baits. None discloses the use of starch in the cooked form, or as a gel matrix.

While all of the prior art devices have varying degrees of effectiveness in controlling insects, none are completely acceptable from the standpoint of effectiveness, ease of manufacture, and economy.

OBJECTS OF THE INVENTION

It is an object of the present invention to provide an insect bait containing an insect-controlling

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material, such as an insecticide or insect repellent, where the materials can be cold blended to provide a gelled bait.

It is another object of the invention to provide
5 a method of providing a gelled insect bait based on relatively inexpensive materials which can be conveniently made with conventional mixing equipment.

It is another object of the present invention to provide an insect bait having a gelatinized stable starch
10 matrix which can be cold blended.

It is another object of the invention to provide a method of providing a gelled insect bait based on relatively inexpensive materials.

It is another object of the present invention to
15 provide an insect bait having a gelatinized stable starch matrix.

These and other objects of the invention will be apparent from the following general description with emphasis being directed to the specific working
20 embodiments.

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DESCRIPTION OF INVENTION WITH PREFERRED EMBODIMENTS

The aforesaid objects of the present invention are accomplished by providing an insect bait based on starch in combination with other ingredients including attractants, insecticides or repellents, and preservatives wherein starch and the other materials are extruded under pressure and temperature sufficient to cook the starch and form a gelatinized stable gel bait matrix. Upon the extrusion of the ingredients at temperatures and pressures sufficient to gelatinize the starch, a stable starch gel is formed having the essential additives uniformly contained therein, which gel is easily utilized as an insect bait.

Alternatively, and as a highly preferred embodiment, the invention is directed to the formation of an insect bait using a pregelatinized starch which has been partially cooked by extrusion to provide a water-absorbing property to the starch. The pregelatinized starch and the essential ingredients of an insect bait such as attractants, insecticides, and/or repellents, preservatives, water, and preferably an emulsifier are cold blended. The water essential for forming the gel bait matrix is absorbed by the pregelatinized starch. In this preferred embodiment heating of the materials during

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formation of the bait is not necessary. However, heating can, at times, be utilized to increase the speed of the gelling process.

The starch, whether extruded with the materials to form a gel or pregelatinized, provides an inexpensive and practical method of forming an insect bait base which is easily used, without messiness, and which is effective in controlling insects. The use of the pregelatinized starch is particularly convenient and effective and, accordingly, is a highly preferred embodiment.

The starch content of the insect bait of the preferred embodiment, i.e., where the starch is pregelatinized, can vary over a range of from about 2.5% to 15% by weight. Below about 2.5% a stable gel will not form, but a flowable gel will result. Above about 15%, the pregelatinized starch will very rapidly absorb water and the viscosity of the mixture will increase too rapidly to allow handling of the material before a gel is formed. It has been found that the preferred range is from about 5% to about 15% pregelatinized starch. This range allows easy handling of the materials before the gel is formed, and once formed the gel is stable and non-flowable at temperatures up to at least about 140° F., which is a temperature at times reached in warehouses or the like

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where the product may be stored. Pregelatinized starches are commercially available under various tradenames and are based on the common starches such as corn flour, cornstarch, maize, tapioca starch, potato starch, rice starch, and the like. Pregelatinized starch as used herein includes the various commercial products which may or may not include additives such as sodium trimetaphosphate to provide improved gelling characteristics.

10 In the embodiment not employing pregelatinized starch but where the starch and other components of the bait are subjected to a range of temperatures and pressures so as to extrude the starch and provide a gel, the starch content can, in the event only an insecticide or insect repellent is employed, range up to as high as 15 99%. The starches employed are again the commonly available starch products including potato starch, corn flour, cornstarch, tapioca starch, maize, and the like.

In the insect baits of the present invention, it 20 is preferable to utilize in addition to the starch other attractants such as fruit extracts, honey extracts, the sugars, i.e., sucrose, fructose, maltose, glucose, molasses, and the like, to make the bait more palatable to insects. Normally, for this embodiment the additional

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attractants will vary from about 1% to 35% and will correspondingly decrease the amount of starch utilized. In the formation of the insect bait by mixing and extruding the components it is essential to utilize additives, including the insecticides and repellents which will withstand the extrusion temperatures of starch without degradation or vaporization. The extrusion temperatures of the insect bait mixture, depending upon the content of starch and other additives, will range between about 160 to about 310° F. at pressures of from about 300 through 800.

The insecticides which can be utilized in the insect baits of the present invention include the insecticides commonly utilized in controlling insects. One insecticide which has been found highly effective is O,O-diethyl-O-(3,5,6-trichloro-2-pyridyl)-phosphorothioate (Dursban). Other commonly employed insecticides include arsenic and metallic salts. In the preferred embodiment utilizing pregelatinized starch, the bait can include any of the insecticides since the materials can be cold blended, or subjected to only slightly elevated temperatures. As previously stated, however, in the embodiment where the materials are mixed and co-extruded, an insecticide which does not degrade under extrusion conditions must be selected. The content of insecticide

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can range from as low as 0.025%, depending upon the insecticide utilized, up to about 4%. Normally, however, the effective amounts of insecticide will fall below about 1.0% by weight.

5 Attractants including sugars, yeast extract, gelatine, and the like, can be utilized to enhance the attraction of the insect to the bait. Normally food attractants such as the sugars will range from about 1% to 90% in the event the pregelatinized starch is employed.

10 It has been found, for example, that corn syrup as an attractant in the range of from about 60% to 90% is desirable when pregelatinized starch is used, as the lowered moisture within the corn syrup can be sufficient to gel the starch source of moisture; whereas, in the

15 event corn flour or yeast extract is used as the attractant, 5% to 15% is highly effective. The aforesaid materials have been found to be effective food ingredients for the insects, particularly ants and cockroaches.

 It has been found desirable when utilizing a

20 pregelatinized starch to utilize an emulsifier to improve the blending of the pregelatinized starch and other ingredients with water in forming the gel bait matrix. The emulsifiers can be any of the commonly employed emulsifiers, and preferably the non-ionic or anionic

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emulsifiers. The amount of emulsifier utilized will vary depending upon the amount of water in the mix. The water content can vary from a minimum of about 5% which is necessary to form the gel to levels of about 15% or 20%.

- 5 In the event a water content of above about 20% is utilized, the time forming the gel is substantially increased. It has been found, however, that effective insect baits can be prepared where the water content is as high as 80% to 90%.

- 10 Other additives can be at times effectively added to the insect bait. These additives include binders such as paraffin wax, synthetic clays, and materials commonly utilized in the formation of insect baits. Preferably, however, when the bait is used as an insecticide only food
15 components are included in the bait.

Having described the invention in general terms, the following two examples define presently preferred embodiments.

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EXAMPLE 1

A mixture of -

Cornmeal ----- 74.5% by weight

Sugar ----- 25.0% by weight

5 Dursban Insecticides ----- 0.5% by weight

TOTAL 100.0%

was dry blended to provide a substantially uniform mixture. The mixture was then extruded in a conventional extruder at a temperature in the range of 200 to 220° F.,
10 and at a pressure of 500 psi. The extruded material was dispensed in containers in the form of a gel. The gel was stable at room temperature and temperatures up to at least about 140° F. The baits were effective in attracting and destroying roaches and ants.

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EXAMPLE 2

An insect bait was formulated containing ingredients as follows:

	Fructose Sugar -----	70.0%
5	Corn flour -----	10.0%
	Yeast Extract -----	5.0%
	Pregelatinized Cornstarch -----	5.0%
	Insecticide - Dursban -----	0.1%
	Emulsifier - Triton X180 which is	
10	an alkyl polyether alcohol	
	anionic emulsifier -----	0.4%
	Water -----	<u>9.5%</u>
	TOTAL	100.0%

The above ingredients were cold blended. Upon complete
15 blending, the materials provided a gel. The gel was
packaged as a stable gel. The all-food bait was effective
in attracting and destroying ants and roaches.

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As will be apparent to one skilled in the art, various modifications can be made within the scope of the aforesaid description. For example, in place of the insecticide of the above examples an insect repellent can
5 be employed. Such modifications being within the ability of one skilled in the art form a part of the present invention and are embraced by the appended claims.

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IT IS CLAIMED:

1. An insect bait comprising a gelatinized starch matrix and an insect-controlling material dispersed in said gel matrix.

5 2. The insect bait of claim 1 wherein said insect bait is formed by co-extruding starch and said insect-controlling material at temperature and pressure conditions which will form a gelatinized starch matrix.

10 3. The insect bait of claim 1 wherein said insect bait is formed by blending pregelatinized starch with an insect-controlling material and source of moisture, said ingredients being selected to form a gelatinized starch matrix.

15 4. The insect bait of claim 3 wherein said insect-controlling material is an insecticide.

5. The insect bait of claim 3 wherein said insect-controlling material is an insect repellent.

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6. The insect bait of claim 4 wherein said bait includes an insect attractant selected from the group consisting of gelatine, corn syrup, sugar, corn flour, molasses, fruit extract, honey extract, and yeast extract.

5 7. The insect bait of claim 5 wherein said bait includes an insect attractant selected from the group consisting of gelatine, corn syrup, sugar, corn flour, molasses, fruit extract, honey extract, and yeast extract.

8. The insect bait of claim 6 wherein said
10 pregelatinized starch is present in an amount of from about 2.5% to 15%; said insecticide is present in an amount of from about 0.025% to 0.5%; water is present in an amount of from about 5% to 10%, and said insect
15 attractant is present in an amount of from about 75% to 94%.

9. The insect bait of claim 2 wherein said insect-controlling material is an insecticide.

10. The insect bait of claim 2 wherein said insect-controlling material is an insect repellent.

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11. The insect bait of claim 9 wherein said bait includes an insect attractant selected from the group consisting of gelatine, corn syrup, sugar, corn flour, molasses, fruit extract, honey extract, and yeast extract.

5 12. The insect bait of claim 10 wherein said bait includes an insect attractant selected from the group consisting of gelatine, corn syrup, sugar, corn flour, molasses, fruit extract, honey extract, and yeast extract.

10 13. The insect bait of claim 9 wherein said pregelatinized starch is present in an amount of from about 2.5% to 15%; said insecticide is present in an amount of from about 0.025% to 0.5%; water is present in an amount of from about 5% to 10%, and said insect attractant is present in an amount of from about 75% to
15 94%.

14. The method of forming an insect bait comprising the steps of co-extruding starch and an insect-controlling material at a temperature and pressure sufficient to cook the starch and form a gelatinized
20 stable gel bait matrix.

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15. The method of forming an insect bait comprising the steps of providing a pregelatinized starch and admixing said pregelatinized starch with an insecticide and source of moisture to form a uniform mixture, said ingredients being controlled whereby after mixing a stable gel is formed.

INTERNATIONAL SEARCH REPORT

International Application No PCT/US 85/00405

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) * According to International Patent Classification (IPC) or to both National Classification and IPC IPC ⁴ : A 01 N 25/04						
II. FIELDS SEARCHED <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Minimum Documentation Searched ⁷</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; border-bottom: 1px solid black;">Classification System</td> <td style="border-bottom: 1px solid black;">Classification Symbols</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">IPC⁴</td> <td style="border: 1px solid black; padding: 5px;">A 01 N</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸</div>			Classification System	Classification Symbols	IPC ⁴	A 01 N
Classification System	Classification Symbols					
IPC ⁴	A 01 N					
III. DOCUMENTS CONSIDERED TO BE RELEVANT *						
Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³				
X A A A	<p>FR, A, 834530 (G.B.R. DE DOMENICO) 22 August 1938 see page 2, line 42 - page 4, line 72; claims</p> <p style="text-align: center;">---</p> <p>Central Patents Index, Basic Abstracts Journal, Section C, AGDOC week B/39, September 1979 (London, GB) abstract no. 70790, & JP, A, 79105234 (Japan Cook) 18 August 1979</p> <p style="text-align: center;">---</p> <p>US, A, 4332792 (G.K. KOHN et al.) 1 June 1982 see claims (cited in the application)</p> <p style="text-align: center;">-----</p>	<p>1,3,4,6,15</p> <p>2,8,9,11, 13,14</p> <p>1,3,4,15</p> <p>1-15</p>				
<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p>* Special categories of cited documents: ¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 48%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"A" document member of the same patent family</p> </div> </div>						
IV. CERTIFICATION						
Date of the Actual Completion of the International Search 5th June 1985	Date of Mailing of this International Search Report 24 JUIN 1985					
International Searching Authority EUROPEAN PATENT OFFICE	Signature of Authorized Officer <div style="text-align: right;"> G.L.M. Kraidenberg </div>					

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/US 8500405 (SA 9064)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 17/06/85

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR-A- 834530		None	
US-A- 4332792	01/06/82	None	

For more details about this annex :
see Official Journal of the European Patent Office, No. 12/82